NO2 Modeling Clarification Memo

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Purpose of memorandum

- Offers guidance on application of recent updates to NO2 modeling options in AERMOD and the clarification on existing related NO2 modeling options:

    - ARM2 current status

    - Selection of Tier 3 approaches: OLM and PVMRM

    - Application of the NO2/NOx in-stack ratio

    - Treatment of background sources and monitoring data

- Disclaimer: information provided here do not necessarily reflect "final" recommendations and are subject to change prior to release of the signed memo.

Background

- Multi-tiered NO2 screening
  - Tier 2
    - The reviewing agency may establish an alternative default NO2/NOX ratio based on ambient annual average NO2 and annual average NOX data
  - Tier 3
   - OLM listed as an option for point sources
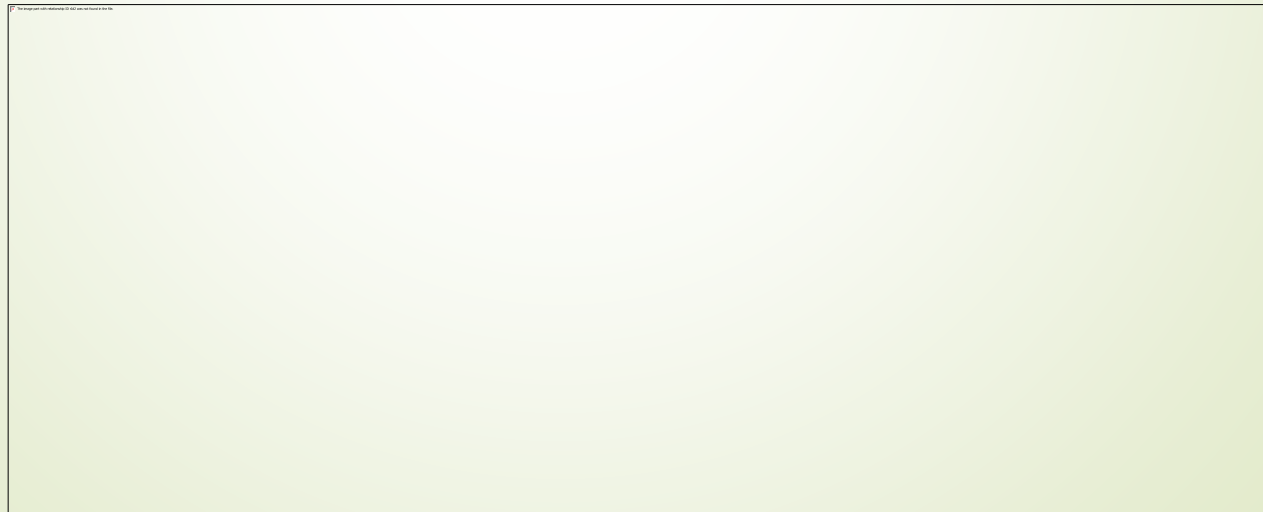
Ambient Ratio Method 2 (ARM2): Current Status

- ARM2 report received from API in spring 2013
- ARM2 pre-view analysis 2013 RSL
- EPA review of report and code summer, fall 2013
- Subsequent revision of report and code, fall 2013
- ARM2 implemented into AERMOD December, 2013 (13350)
- Expected guidance, pending additional review
  - Expect to generally allow ARM2 as a Tier 2 option
  - Caveats when there may be a high NO2 in-stack ration
  - Caveats when there may be consistently high ozone days

Figure 1– NO$_2$/NO$_X$ Ratios for All AQS Monitoring Sites for 2001-2010
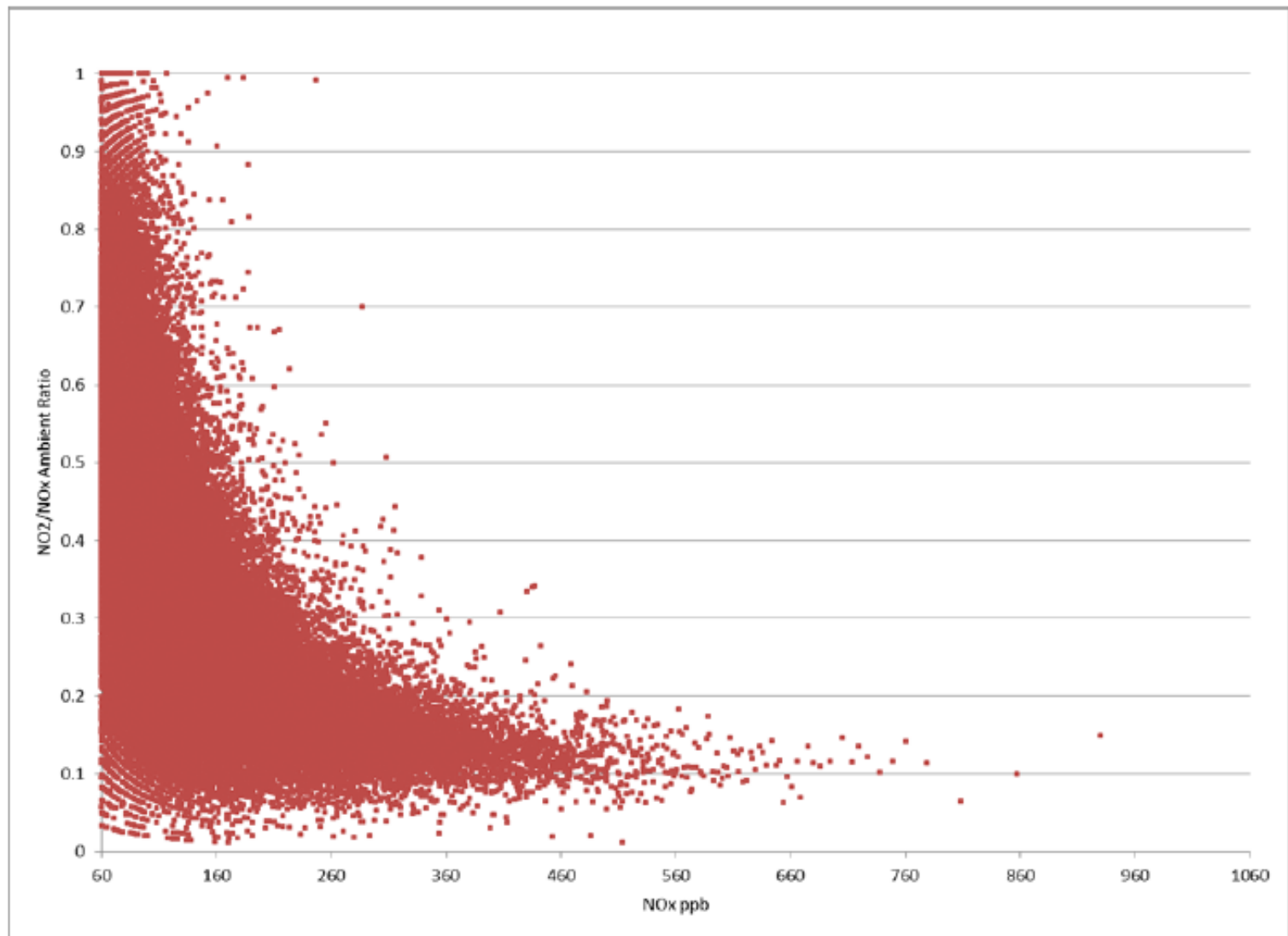
NOTE: There are approximately 6,800,000 valid hourly data points from 530 monitoring stations in this data plot. The X-axis for this plot begins at 60 ppb to limit the number of hourly data points to a size that the spreadsheet program can process.

Selection of Tier 3 Approaches: PVMRM and OLM

- PVMRM and OLM are more resource-intensive approaches that approximate NO2 chemistry and can be used for non-point sources

- Plume Volume Molar Ratio Method
  - Works best with single or few, elevated, isolated sources
  - Plume volume can be overestimated in some cases, resulting in unrealistically high NO conversion
    - Multiple sources, particularly when moderately spread apart
    - Area sources that have a large length:width (i.e., roadways)
    - Surface releases, since PVMRM does not account for surface reflection

- Ozone Limiting Method
  - OLMGROUP ALL recommended in cases where PVMRM is known to have issues

Application of the NO2/NOx in-stack ratio

- EPA initiated effort to collect in-stack NO2/NOx data in August, 2012

    - http://www.epa.gov/scram001/NO2_isr_database.htm

    - Submission is open to everyone

    - 2 submissions to date, ~2,150 data points

- March 2011 NO2 memo recommended a default ratio of 0.5 in lieu of source-specific data

- Updated guidance:

    - Default ratio of 0.5 for primary source

    - Default ratio of 0.2 for nearby sources

Treatment of background sources and monitoring data

- OLM and PVMRM require background NO2 and ozone
- Current version of AERMOD allows directional selection of background
  - Multiple background monitors can be specified
  - One selected based on the wind direction
- March 2011 memo provides many examples of when an upwind versus a downwind monitor should be selected
  - Generally, for background NO2 and ozone data, the downwind monitor should be used so that modeled concentrations are added to concentrations representative of the receptor

Questions?